Worksheet to Identify Potential Indicators for Ecological Monitoring

You return to visit your park in 20 years and walk through the park with the current resource manager. The manager tells you about the current condition of the natural resources, the management issues, and threats of the day. What would that person describe to you?

Some housing development on the east side of the park about 1 mile away. Bridge over Hell Canyon and modification to the road for safety reasons (stop gap measures may occur in the interim). Potential microbial life in the cave. Still dealing with visitation issues such as transportation system, moving development, etc.. Impacts to cave resources. Mapping the cave and associated impacts. Still controlling exotic plants and cognizant of herbicides. Still using fire. Managing the meadows. Air quality from development in Wyoming. State cement quarry in lower part of Hell Canyon could result in air quality issues.

What are the communities at your park (e.g., native mixed-grass prairie, barren badlands topography, prairie stream, forested riparian area) and approximate percentage of total area?

Mostly ponderosa pine forest but now have meadows forming and other post-burn habitats. Some aspen in Hell Canyon. Three-four springs with moist soil and associated plants. Along some of cliffs.

What are the park's most significant natural resources (e.g., the river and its tributaries, caves and cave fauna, rare plant communities, elk herd)?

The cave and potentially its microbial biota. One of largest Townsend's hibernacula in the world. Paleontological fill cone with bones and organic debris. Some remnant old growth (5 acres) in Historic area and north of the highway (north of main entrance to park). Hydromagnesite balloons (cave speleothems).

What does your park contribute to regional biological diversity (e.g., what natural resources are preserved and protected at your park that are altered or threatened throughout the rest of the region)?

Bat hibernacula.

What park-specific legislative mandates direct the park to monitor a particular natural resource at your park.

What federally-listed threatened and endangered species are known to occur in the park?

What state-listed threatened and endangered species are known to occur in the park?

Four rare plants according to Amy, most likely from Marriot list. Some of the bats are likely on the state list. Mountain lion. Perhaps tawny crescent.

What is that status of your park's management plans?

Fire plan in draft. GMP about 10-11 years old. RMP from 1999. Cave management plan in preparation. Draft vegetation and exotic management plan. Comprehensive Interpretive Plan in draft.

What is currently being monitored at or near the park by NPS or other entities (e.g., plants by fire effects program, plants by LTEM, exotic plants by exotic plant teams, birds by Breeding Bird Survey, butterflies, stream by USGS, Christmas bird count, weather data, NRCS photography, visitors by park staff, state roadside counts --- use the checklist below)?

Air: No air quality at JECA.

Amphibian: No.

Birds: Did 1 or 2 Christmas bird counts many years back but no longer doing. Duane Weber from WICA may have done 3 years in a row in Lithograph Canyon – check with him.

Fire: Have established Fire Effect plots. Jack Butler's work.

Fish: NO

Geology: Photo monitoring in cave which is currently in active due to changing priorities. Could be re-active.

Mammals: Annual mid-winter bat monitoring at genus level with population estimates visual observations. Park is pretty comfortable with the level of monitoring effort.

Meteorology: Temp and precip. Cave micro-climate temp and humidity and micro-barograph walk instruments into about 10 sites done monthly. Just a scenic tour route. Two hobos in cave. Could potentially use more of those units.

Pests: Park puts out gypsy moth traps every summer.

Pesticides: Taking water samples from cave and sending to SDSU for herbicides. Expect to continue doing this as long as herbicides are being using.

Reptiles: No

Soils: No

Sound: No

Vegetation: Fire Effects monitoring. EPMT program.

Visitors: Traffic numbers on entrance. Know number in cave on routes and off-tour route.

Visual Landscape: Photo monitoring in cave.

Water Quality: Chloride, lead, nitrate at 4-5 sites in cave and 7 surface springs. Take samples monthly and sent to Mid-Continent testing lab. Started in early 90s with 20 sites and now reduced to lesser number. Road salts from highway may be a stressor. Fecal coli form and chlorine sent to same lab for drinking water. Park plans to continue.

Wildlife or Plant Disease: No.

What are the stressors on park resources? What are the sources of each stressor?

Visitors being in cave and bringing lint, hair, skin cells. Potential touching and breaking of cave features.

Surface development for park facilities, highway, private area, mineral withdrawal.

Sewage system effects, leaks, potential overflow.

Air quality to the west and effects on plants.

For your park, what are some monitoring questions relating to external natural resource threats (e.g., does the water quality of Cub Creek meet EPA's Clean Water standards? Are exotic plants displacing native species in prairie remnants? Is urban encroachment changing deer populations within the park?)?

What are some monitoring questions relating to current internal natural resource management actions (e.g., is the prescribed fire regime maintaining healthy native prairie?)?

Are we reducing the composition, distribution and abundance of exotic plants.

Is visitor use affecting micro-climate in the cave. Affecting new potential cave routes.

Are paraffin lanterns have desired effects.

Are reduced visitor rates reducing impacts.

Is the bat cave effective and not impacting bats.

What are some potential indicators of resource decline or improvement (e.g., water chemistry, fish community, aquatic macroinvertebrates, exotic species distribution or abundance, plant community composition, deer density, browse-line) due to the external threats?

What are potential indicators of success/failure of the internal management actions (e.g., plant community composition, butterfly diversity, nesting grassland birds)?

What potential management actions in the future may require monitoring (e.g., potential species reintroductions, land acquisitions, commercial uses)?

What would your partners like you to monitor?

Vital signs are: 1) sensitive enough to provide early warning of change, 2) have low natural variability, 3) can be accurately and precisely measured, 4) have costs and effort of measurement that are not prohibitive, 5) have monitoring results that can be interpreted and explained, 6) are low impact to measure, and 7) have measurable results that can be replicated with various personnel. Off the top of your head, look into your crystal ball and choose several vital signs to monitor over time to track the condition of natural

resources within your park (items can range from broad, e.g., the stream, to narrow, e.g., a particular species). What are those vital signs? Rank them in order of importance.

1. The cave (most likely abiotic measures such as temperature, perhaps flow rates), especially in response to visitors. Establishing thresholds will be a challenge.

2. Water quality in the springs.

3. Vegetation monitoring.

3. Bats, although current protocols may be okay. May want to expand.